I. Declaration Under 37 CFR §1.132

A Declaration Under 37 CFR §1.132 by Robert J. Warmack is submitted along with this Amendment, filed of even date herewith and incorporated herein by reference.

II. Rejection Under 35 U.S.C. §112, second paragraph

Claim 24 has been rejected under 35 U.S.C. §112, second paragraph. By way of the Amendment, the words "electromagnetic and" have been deleted from the preamble of claim 24 as suggested by the Examiner. Accordingly, Applicants believe that the rejection under 35 U.S.C. §112, second paragraph is overcome.

III. Rejection Under 35 U.S.C. §103

Claims 1-23 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the article by Barnes et al. (NATURE, vol. 372, 3 November 1994, pages 79-81) ("the Barnes paper") and U.S. Patent No. 3,896,309 to Halsor et al. ("the Halsor '309 patent") in view of U.S. Patent No. 3,415,712 to Barker ("the Barker '712 patent") and U.S. Patent No. 5,550,516 to Burns et al. ("the Burns '516 patent"). This rejection is respectfully traversed.

Applicants submit evidence in response to this rejection in the form of the Declaration Under 37 CFR §1.132. This

Declaration is evidence that claims 1-23 were not unpatentable over the Barnes paper and the Halsor '309 patent in view of the Barker '712 patent and the Burns '516 patent because one of ordinary skill in the art, at the time the invention was made, would not have been motivated to combine these references as the Examiner suggests. The Declaration is also evidence that the cited references, alone or in combination, neither teach nor suggest the claimed invention.

The Barnes paper cited by the Examiner in the Office Action dated January 30, 1998 describes a technique of studying material properties, specifically how much radiant energy a material is able to absorb and convert into heat (as measured by a bimaterial cantilever) in order to identify and characterize the material. The Barnes paper states, "A measurement of photothermal heating as a function of wavelengths can provide an absorption spectrum of the material." (page 79, col. 2) As a consequence materials can be characterized, such as in FIG. 3 at page 81, col. 1 of the Barnes paper, where the peaked absorbance in fluorescein dye in latex spheres that were loaded on the cantilever is illustrated. The amount of the incident radiation was unimportant in the Barnes paper, but the response of the fluorescein was.

The Barnes paper does not relate to detecting radiation but rather to its effects on materials that would otherwise be

difficult to measure because of their volume or the precision involved. The use of radiation in the Barnes paper is incidental to the goal of measuring the photothermal properties of the materials attached to the cantilever. Applicants cite the Declaration Under 37 CFR §1.132 as evidence of this point. In the pending application, Applicants claim monitoring changes in a physical property of the microcantilever and correlating changes in the physical property to a measure of radiation. The Barnes paper does not teach or suggest either one of these functions.

The Barnes paper states (see page 80, col. 2) that the "Thermally induced bending of the cantilever...as a function of wavelength generates a photothermal spectrum [of the material]". "This fundamental sensitivity of the present device offers new possibilities for the investigation of a wide range of materials." (page 81, col. 2) This shows that the Barnes paper does not relate to a measure of radiation, but to investigating the material on the cantilever.

In the Halsor '309 patent cited by the Examiner in the Office Action dated January 30, 1998, the gate electrode comprising the cantilevered element 26 is spaced above the oxide layer 16 and will be deflected downwardly or upwardly in response to radiation and resultant heating. The device may be interrogated by pulsing the gate electrode or cantilevered

element 26 such that an inversion layer 38 (FIG. 1), in this case a P-channel, will be enhanced or depleted between the source and drain regains 12 and 14. That is, assuming that the cantilevered gate electrode 26 is biased negative with respect to the substrate 10, the P-type channel 38 will be enhanced. On the other hand, if the polarity of the bias voltage is reversed, then the channel 38 will be depleted.

Assuming that the enhancement mode is employed, the current flowing between the source and drain will be inversely proportional to the distance between the cantilevered gate electrode 26 and the upper surface of the substrate 10. As is known, the characteristics of a MOS field effect transistor are greatly affected as its gate dielectric is altered. In this case, the gate dielectric is a passivating oxide layer 16 together with the variable separation between the cantilevered gate electrode 26 and substrate 10. Since the distance between the cantilevered gate 26 and the inversion layer or channel 38 is proportional to the flux density of radiation, the current flow between the drain and source is also proportional to the density of radiation.

The cantilever in the Halsor '309 patent is a gate electrode in a field effect transistor (FET) arrangement. The changing induced charge underneath the gate electrode causes the change in

current from source to drain.

The Halsor '309 patent describes a complex process of making an FET and micromachining a bimaterial cantilever. In this arrangement the cantilever is a conducting electrode in addition to being bimaterial. Application of voltage to the cantilever with respect to the substrate will change the bending due to electrostatic field. The bending is not uniform due to the changes in spring constant caused by the additional electric field that has a non-vanishing derivative.

Turning again to the Barnes paper, the cantilevers were made selective for certain wavelengths by coating the cantilevers with selective materials to study the materials. The Barnes paper focusses on infrared spectroscopy using cantilevers and scanning monochromators. The cantilever is coated with material that selectively absorbs certain wavelengths. A wavelength dispersion is achieved (spectroscopy) by scanning the wavelengths falling on the cantilever. The intensity of the cantilever response is then plotted as a function of wavelength showing enhanced absorption of the coating material. The Barnes paper focuses on characterization of the coating when compared with an uncoated cantilever rather than detecting radiation.

The Barnes paper and the Halsor '309 patent relate to different technical fields. The Halsor '309 patent is non-

analogous art with respect to the Barnes paper. Thus, the Halsor '309 patent cannot properly be combined with the Barnes paper to support this rejection.

The claims of the pending application recite "the change causes a response selected from the group consisting of a bending of the microcantilever, a shift in resonance frequency of the microcantilever, and a combination thereof; and correlating changes in the at least one physical property to a measure of the electromagnetic radiation." (claims 1 and 17, as amended)

The claimed invention utilizes both microcantilever bending and resonance frequency shifting. Such a response can be due to heating, or changes in material or mechanical property. The material or mechanical property change can be curing (permanent change), bond breaking (permanent change) or bond stretching (temporary change).

The microcantilevers can be partially coated (e.g., claim 18) or coated along its entire length for maximizing bimaterial effect. The effect can be enhanced by adding a thermal insulation region at the base of the cantilever. The response can be detected optically, piezoresistively, or capacitively. This effect can be used to make images of objects using an array (e.g., claim 11). Such an array obtains wavelength selectivity.

Claims 1 and 17 of the pending application recite

"correlating changes in the at least one physical property to a measure of the electromagnetic radiation. Claim 10 recites "the correlating step includes correlating changes in capacitance to the presence of radiation." The Barnes paper does not correlate anything to a measure of radiation as claimed. Applicants submit the Declaration Under 37 CFR §1.132 as evidence of this point.

Turning to the Barker '712 patent, in addition to the different readout system noted by the Examiner in the Office Action dated January 30, 1998, differences between the Barker '712 patent and the invention claimed in the above-identified application include that the device in Fig. 5 of the Barker '712 patent is a device wherein a change in capacitance occurs in response to a change in temperature. With the arrangement shown in Fig. 5 the capacitance between electrode 42 and bimaterial strip 43 will increase with an increase in temperature. Detecting a change in temperature is not the same thing as detecting radiation. As such, the Barker '712 patent is non-analogous art with respect to the claimed invention.

Applicants respectfully submit the Declaration Under 37 CFR §1.132 as evidence that one of ordinary skill in the art of detecting radiation would not look to the Barker '712 patent for guidance in solving problems related to radiation detection. Thus, the Barker '712 patent cannot properly be combined with the

Barnes paper and the Halsor '309 patent to support this rejection.

Turning to the Burns '516 patent, the text of the Burns '516 patent does not discuss radiation detection. The words at col. 1, lines 50-54 and col. 2, lines 41-44 are evidence of the meaning of the Burns '516 patent. Specifically, the Burns '516 patent pertains to measuring pressure, acceleration, force, other applied stimuli, and acceleration, temperature, air flow, and humidity, but not radiation. Applicants respectfully submit the Declaration Under 37 CFR §1.132 as evidence that at the time of the invention claimed in the above-identified application, the Burns '516 patent would not have been relevant to one of ordinary skill in the art of detecting radiation, and that one of ordinary skill in the art of radiation detection would not look to the Burns '516 patent in order to augment, modify or change the structure described by the Barnes paper or the Halsor '309 patent. Thus, the Barnes paper and the Halsor '309 patent cannot properly be read in view of the Burns '516 patent.

The amendments highlight important distinctions between the claimed invention and the cited references, that among these are the radiation-induced bending of the microcantilever in combination with a shift in resonance frequency of the microcantilever.

In light of the amendments and these remarks, Applicants respectfully submit that the rejection under 35 U.S.C. §103(a) is overcome.

IV. Conclusion

Since the claims point out new and unobvious features not found in, nor suggested by, the references cited by the Examiner, reconsideration and allowance of the claims are requested.

ADDITIONAL FEES

The Assistant Commissioner is hereby authorized to charge additional fees which may be required for this Amendment, or credit any overpayment to Deposit Account No. 13-4503, Order No. 2240-7141.

EXTENSION OF TIME

In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Assistant Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No. 13-4503, Order No. 2240-7141.

Date: May 27, 1998

Respectfully submitted,

Chris Hamaty

Christopher J. Hamaty
Registration No. 37,634

(202) 857-7887
(202) 857-7929 facsimile

Morgan & Finnegan, L.L.P.
345 Park Avenue
New York, NY 10154